July 25, 1967 J. T. SMITH 3,332,364

IMPACT ABSORBING APPARATUS

Filed Sept. 10, 1964 2 Sheets-Sheet 1

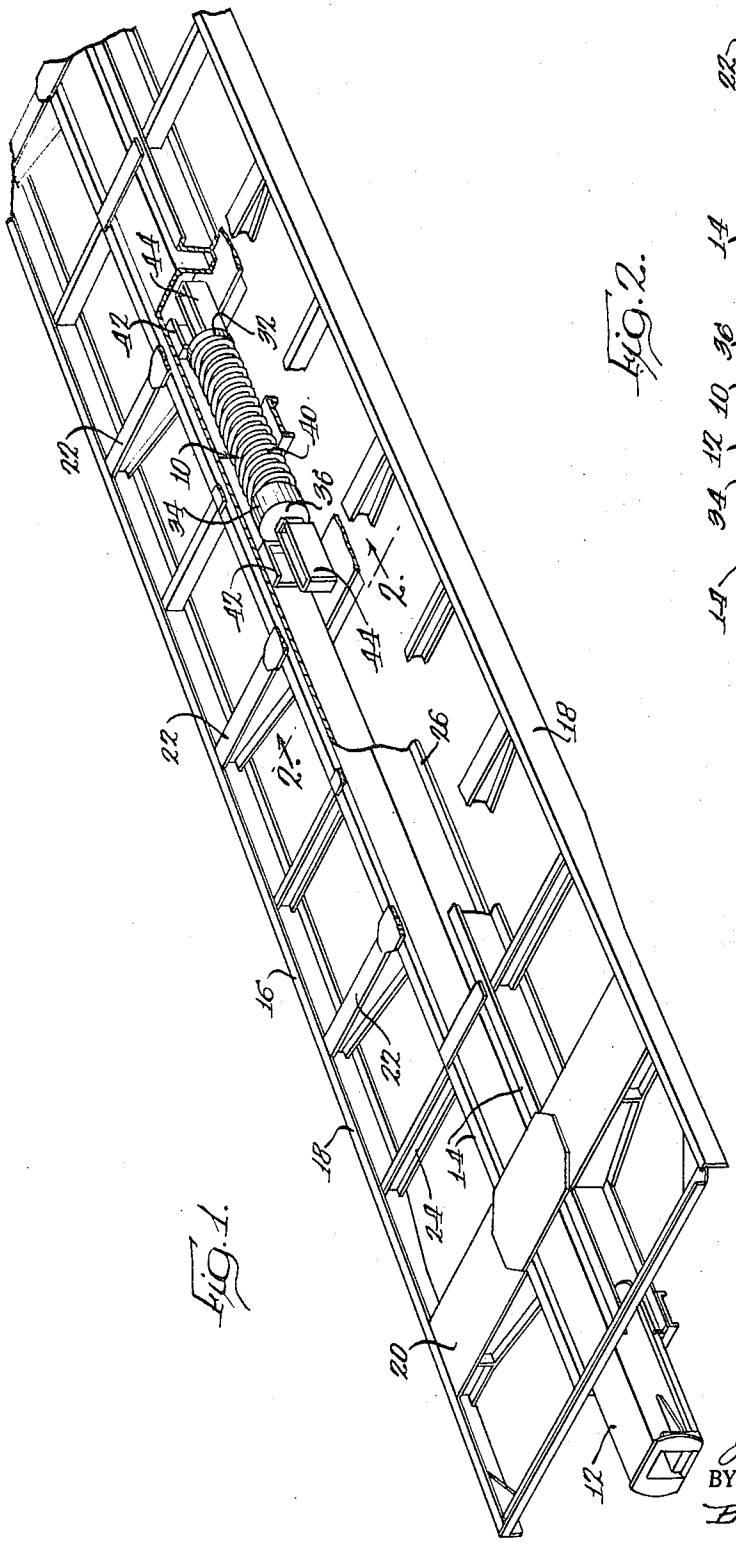


Fig. 1.

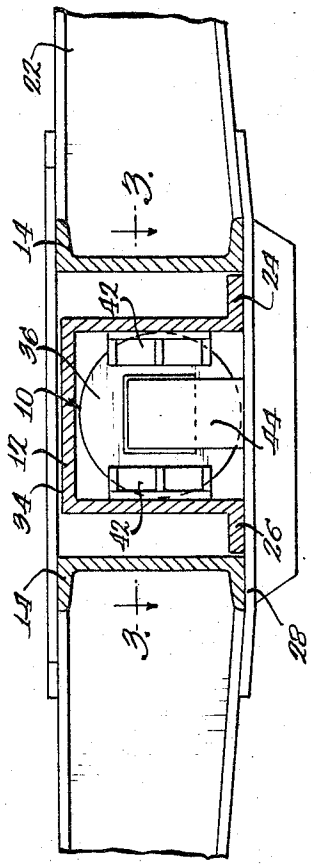


Fig. 2.

INVENTOR.
James T. Smith
BY
B. Gordon Aller
Atty

July 25, 1967 J. T. SMITH 3,332,364

IMPACT ABSORBING APPARATUS

Filed Sept. 10, 1964 2 Sheets-Sheet 2

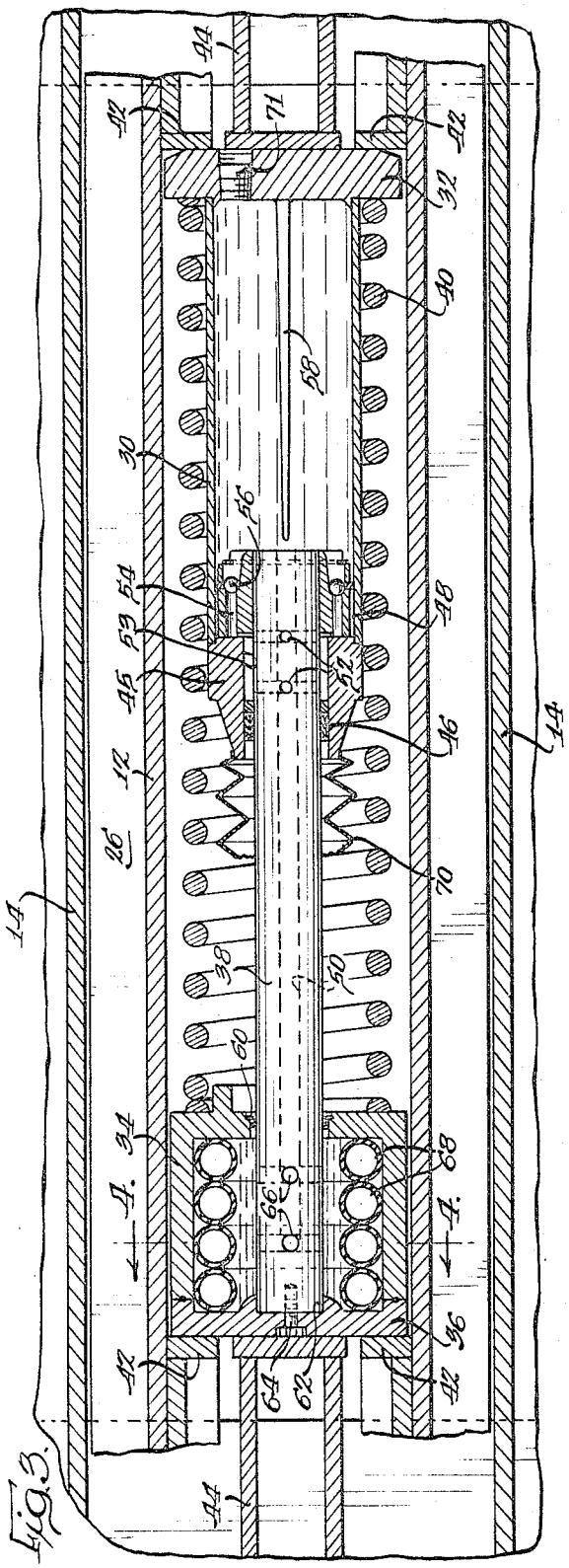


Fig. 3.

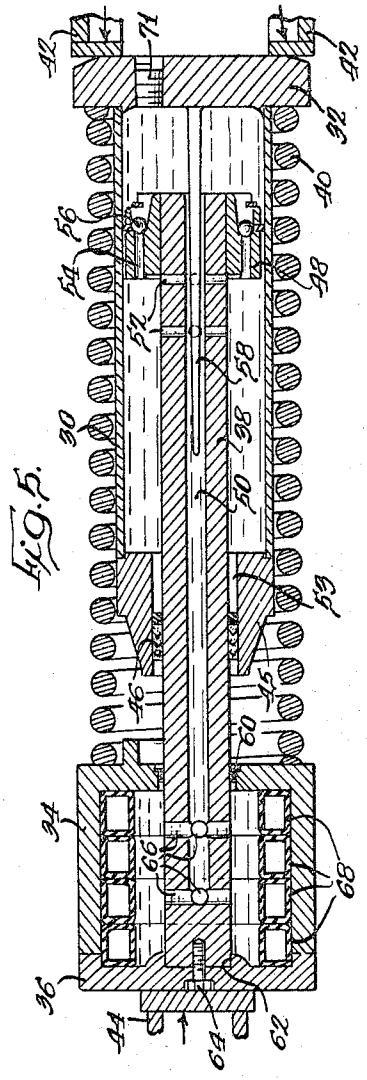


Fig. 5.

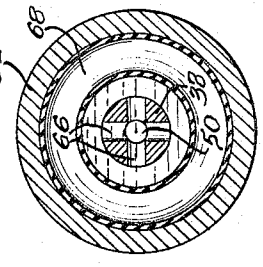


Fig. 4.

INVENTOR.
James T. Smith
BY
B. Gordon Aller
Atty

United States Patent Office

3,332,364

Patented July 25, 1967

1

3,332,364

IMPACT ABSORBING APPARATUS

James T. Smith, Wilmette, Ill., assignor to Keystone Railway Equipment Company, Chicago, Ill., a corporation of Delaware

Filed Sept. 10, 1964, Ser. No. 395,390

3 Claims. (Cl. 105—454)

The present invention relates to an impact absorbing apparatus, and in particular to an improved impact absorbing apparatus for railway rolling stock.

Railway rolling stock, particularly freight cars, is subject to appreciable impacts in switch and classification yards where the trains are both broken up and made up. It is customary to attempt to limit the speed of the free rolling cars so that at the time of impact with another car the speed is not more than three or four miles per hour. However, this is not always possible and speeds as high as ten, twelve, or more miles per hour are known. Also, coupling speeds of ten, twelve, or more miles per hour are not uncommon in making up the train or picking up cars from sidings, loading docks, and the like.

Tremendous thought, study, and research have been given to the problem of protecting the load or lading against damage from the impacts given to a fully or partially loaded freight car during coupling. The character of the lading itself usually dictates the best way it should be secured in a car. Some of the securing techniques provide for a controlled and limited movement of the load within the car to absorb the coupling or similar impact without damage to the load.

The draft gear connected to the coupler absorbs a part of the shock, but its effectiveness is limited by the severe limitation on the movement of the coupler relative to the remainder of the car. This movement is about two and three-quarter inches so as to minimize the amount of slack in a train that has to be taken up on starting and absorbed on stopping.

It has been proposed to interpose an impact absorbing cushion in the car between the draft gear and the lading which will permit the lading to move up to a certain distance on impact and thereafter be restored to its original or normal position. Alternatively, the impact absorbing cushion is interposed between the center sill for buff and draft and the underframe of the railway car. These cushions are of various designs and permit maximum movement from as little as eight inches up to as much as 40 inches. It is thought by some that the longer the cushion movement the greater the protection afforded to the lading. A principal difficulty with long cushion movement is the projection of the center sill for buff and draft beyond the end of the car a distance of 40 inches more than normal. This of course projects the coupler 40 inches greater beyond the end of the car than theretofore. When cars of this type are coupled into a train, particularly when coupled to each other, difficulties are encountered in sharp curves and it has been found necessary to prevent the routing of such cars over trackage which has such curves. This long projecting sill also makes coupling of these cars extremely difficult unless the coupling is done on straight track.

The present invention is concerned with improvements in impact absorbing cushions whereby whatever advantages exist in long movement may be retained with a cushion movement which is appreciably shorter.

It is therefore a principal object of the present invention to provide a hydraulic impact absorbing cushion be-

2

tween the draft and gear and the lading in a freight car, having a movement less than half the maximum movement of long movement devices now available while retaining the load protecting advantages of such devices.

Another object is to provide a hydraulic impact absorbing cushion between the draft gear and the lading in a freight car, wherein the maximum lading movement is less than 20 inches.

Another object is to provide a hydraulic impact absorbing cushion incorporating a hydraulic cylinder and a separate reservoir, interconnected by a piston rod fixed to the reservoir and to a piston slidable in the cylinder, with a flow metering bore through the piston rod and an excess fluid compensating means in the reservoir.

Another object is to provide a hydraulic impact absorbing cushion incorporating a hydraulic cylinder and a separate reservoir, interconnected by a piston rod fixed to the reservoir and to a piston slidable in the cylinder, with a flow metering bore through the piston rod and excess fluid compensating compressible sealed hollow air containing rings in the reservoir.

Other objects and advantages will become apparent from the following description taken in conjunction with the accompanying drawings, wherein

FIG. 1 is a fragmentary perspective view of the underframe of a railway car, partly broken away to illustrate the manner of mounting the impact absorbing apparatus of the present invention between the center sill for buff and draft and the underframe;

FIG. 2 is a vertical sectional view on an enlarged scale, taken along the line 2—2 of FIG. 1, looking in the direction of the arrows;

FIG. 3 is a medial plan sectional view taken through the impact absorbing apparatus of the present invention, showing the apparatus in normal position;

FIG. 4 is a transverse sectional view taken through the fluid reservoir along the line 4—4 of FIG. 3, looking in the direction of the arrows; and

FIG. 5 is a view similar to FIG. 3, on a smaller scale, showing the impact absorbing apparatus in partially collapsed position.

Referring to FIG. 1, it can be seen that an impact absorbing device 10 is interposed between a slidable center sill 12 for buff and draft and an underframe center sill 14 within which it is mounted. Underframe 16 includes the conventional side sills 18, bolsters 20 (only one of which is shown), cross bearers 22, and other transverse bracing 24. The bolsters are mounted on conventional trucks which ride on the rails, and the underframe 16 supports the conventional box or other lading containing structure. Conventional couplers and draft gear (not shown) are carried by the slidable center sill 12 and the extreme ends thereof.

The slidable center sill 12 as seen in FIG. 2 has an inverted channel-shaped configuration with side flanges 26 which slide on cross plates 28 carried by the various transverse frame members.

The impact absorbing device 10 includes a cylinder 30 having a cylinder head 32, and a reservoir 34 having a head 36 with a piston rod 38 extending between the cylinder 30 and the reservoir 34. A heavily loaded spring 40 (6000 pounds, for example) extends between the cylinder head 32 and the reservoir 34 urging them apart and also urging the cylinder head 32 and the reservoir head 36 into engagement with stop lugs 42 carried on the slidable center sill 12 and into engagement with force transmitting stop members 44 carried on the underframe 16 of the car.

When there is relative movement between the center sill **12** and the frame center sill **14**, one or the other of the heads **32** and **36** is moved away from the stop lugs **42** while the other head is moved away from the underframe stop member **44**. The normal position is that as shown in FIGS. 1 and 3 while an impact transmitting position from the right coupler is shown in FIG. 5.

The piston rod **38** projects into the cylinder **30** through a suitable packing **46** in a rod end cylinder head **45**, and is connected to a piston **48** slidable in the cylinder. The piston rod **38** extends to the head end of the piston **48** and has a bore **50** extending throughout its length so as to communicate the head end of the cylinder **30** with the rod end and with the reservoir **34**. The piston rod **38** is therefore provided with portts **52** which are immediately to the underside of the piston **48** and communicate with an enlarged counterbore **53** in the head **45** so that as it travels rightwardly in the cylinder **30**, the hydraulic fluid is taken in at the head end of the bore and is expelled into the rod end of the cylinder to permit the rightward travel of the piston.

The piston **48** is also provided with several passages **54** connecting the rod end thereof with the head end, with each passage being provided with a check valve. This arrangement permits relatively free flow therethrough from the rod end of the piston **48** to the head end upon the leftward movement of the piston so as to facilitate the restoration of the impact absorbing device to normal position under the force exerted by the expanding spring **40**.

A tapered flow metering pin **58** is secured as by welding to the inner face of the head **32** and positioned so as to enter the bore **50** in the piston rod **38** as the piston **48** moves rightwardly in the cylinder **30**. The taper on the pin **58** is such as constantly to reduce the capacity of the open end of the bore **50** and thereby to diminish the outflow rate from the cylinder **30** and to increase the flow restriction. By the time piston **48** has reached the head **32**, the open end of the bore **50** is substantially closed.

The piston rod **38** extends into the reservoir **34** through appropriate packing **60** and is seated in a recess **62** formed on the inner face of the reservoir head **36**. A piston rod is affixed to the reservoir head **36** by a bolt **64** or similar securing means. Thus the piston rod **38** and reservoir **34** move as a unit.

A group of minimum flow restriction ports **66** communicate the interior of the reservoir with the bore **50** through the piston rod **38**, thereby placing the interior of the reservoir **34** in communication with the head end of the cylinder **30**.

The reservoir **34** is substantially filled with a plurality of hollow rings **68**, four being shown. The rings **68** are sealed to contain air therein and are made of neoprene, oil resistant rubber, or similar material. When the hydraulic fluid is expelled from the head end of the cylinder **30** through the bore **50** and ports **66**, the reservoir becomes overfilled with fluid due to the displacement by the rod **38**, thereby collapsing the rings **68** against the pressure of the air contained therein. As seen in FIGS. 3 and 4 the rings **68** are compressed outwardly against the inner wall of the reservoir **34**.

The piston rod **38** has its exterior surface between the cylinder **30** and the reservoir **34** protected by a bellows-like boot **70** which is secured to the rod end head **45** of the cylinder and that portion of the reservoir which faces the cylinder. The hydraulic cushion is charged with fluid through a suitable fitting **71** in the cylinder head **32**.

In normal position the spring **40** holds the cylinder head **32** and the reservoir head **36** against the center sill lugs **42** and the underframe stop members **44**. Should the car receive an impact from the left end (FIGS. 1 and 3) the center sill **12** will be moved rightwardly within the frame sill **14**. The lugs **42** abutted against the reservoir head **36** will move the reservoir **34** toward the

piston **30** whose head **32** will be maintained against the underframe stop **44**. The pin **58** enters the bore **50** for the purpose of metering the outflow of hydraulic fluid from the head end of the cylinder **30**, thereby increasing the resistance to piston travel rightwardly and a greater absorption of the impact. Fluid is expelled through the bore **50**, the ports **52** behind the piston **48** to the counterbore **53** to permit initial piston travel and through the ports **66** into the reservoir **34**. This excess fluid will compress the doughnut-like rings **68** against the pressure of the air therein, further giving resistance to the apparatus for absorption of the impact.

After the impact has been absorbed and the system returns to normal, the spring **40** expands, moving the reservoir **34** and cylinder **30** apart. As this occurs, the cylinder head **32** engages the center sill lugs **42** and the reservoir **34** is engaged by the stop frame member **44**. The hydraulic fluid is transferred from the rod end of the cylinder to the head end through the ports **52** and passage **50** and also through the piston passages **54** past the check valves **56** which open to accommodate this flow. This greater capacity permits the system to be restored to normal position with less restriction than present during collapsing of the cushion. The doughnut-like rings **68** also expand to their normal position, expelling fluid from the reservoir **34** through the ports **66** and the bore **50** to the cylinder **30**.

The same operation takes place if the impact is from the right end, in which case the lugs **42** would move the cylinder toward the reservoir and the left stop frame member **44** would be held against the head **36** of the reservoir **34** (FIG. 5).

From the foregoing specification it will be appreciated that the objectives which were set forth for this invention at the outset hereof are fully attained by the structure disclosed.

While a preferred embodiment of the invention has been shown and described, it will be apparent that numerous modifications and variations thereof may be made therein without departing from the underlying principles of the invention. It is therefore desired, by the following claims, to include within the scope of the invention all such variations and modifications by which substantially the results of the invention may be obtained through the use of substantially the same or equivalent means.

What is claimed as new and desired to be secured by United States Letters Patent is:

1. In an impact absorbing apparatus for interposition between the draft gear and the lading in a railway car of the type having a buff and draft center sill and a lading supporting frame mounted for movement relative to each other, the apparatus having a pair of heads normally abutted against stop lugs carried on the center sill and force transmitting stops carried on the lading supporting frame, and a spring urging the heads toward normal position, the improvement comprising, a cylinder mounting one of the heads, a fluid reservoir mounting the other of the heads, a piston slidable in said cylinder, a piston rod connected to said piston and to said fluid reservoir, a bore through said piston rod open to the head end of the cylinder, first ports in said piston rod connecting said bore with said reservoir, second ports in said piston rod connecting said bore with the rod end of said cylinder, check valve controlled passages through said piston permitting fluid flow only from the rod end to the head end of said cylinder, a tapered flow metering pin in said cylinder adapted to enter said piston rod bore to restrict increasingly fluid flow therethrough during an impact absorbing movement of the piston in the cylinder, and a plurality of air filled compressible hollow rings substantially filling said reservoir when the impact absorbing apparatus is in extended position and adapted to be compressed upon the transfer of fluid from the head end of the cylinder to the reservoir.

2. The impact absorbing apparatus as set forth in

claim 1, wherein said hollow rings are of round transverse section.

3. The impact absorbing apparatus as set forth in claim 1, wherein said hollow rings are of rectangular transverse section.

References Cited

UNITED STATES PATENTS

2,856,035	9/1958	Rohacs	188—100
3,033,384	5/1962	Zanow et al.	213—43
3,070,363	12/1962	Ellis	188—100
3,078,967	2/1963	Brown et al.	188—88
3,164,262	1/1965	Price et al.	213—8
3,175,699	3/1965	Price et al.	213—43

ARTHUR L. LA POINT, *Primary Examiner.*

D. E. HOFFMAN, *Examiner.*